

**Citation:**

Centers for Disease Control and Prevention (CDC). Spina bifida and anencephaly before and after folic acid mandate; United States, 1995-1996 and 1999-2000. *MMWR Morb Mortal Wkly Rep*. 2004. 53: 362-365.

**PubMed ID:** [15129193](#)

**Study Design:**

Non-comparative descriptive report

**Class:**

D - [Click here](#) for explanation of classification scheme.

**Research Design and Implementation Rating:**

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To update the estimated numbers of neural tube defect (NTD)-affected pregnancies and births. The Centers for Disease Control (CDC) recently analyzed data from 23 population-based surveillance systems that include prenatal ascertainment of these birth defects.

**Inclusion Criteria:**

Data from 23 population-based surveillance systems that include prenatal ascertainment of these birth defects from two 24-month periods (pre-fortification period: 1995 to 1996 and post-fortification period: 1999 to 2000).

**Exclusion Criteria:**

Not applicable.

**Description of Study Protocol:****Recruitment**

Not applicable.

**Design**

Non-comparative descriptive study.

**Dietary Intake/Dietary Assessment Methodology**

Not applicable.

**Blinding Used**

Not applicable.

**Intervention**

Not applicable.

**Statistical Analysis**

- The numbers of annual NTD-affected birth defects were calculated from 24-month pre-fortification period (1995 to 1996) and a 24-month post-fortification period (1999 to 2000)
- CDC estimated prevalence for spina bifida and anencephaly from eight population-based surveillance systems that collect data from sources that perform diagnostic prenatal ultrasound as part of their surveillance programs
- Estimated total of NTD-affected pregnancies were calculated by adding spina bifida and anencephaly-affected pregnancies
- 15 population-based birth defects surveillance systems, which do not collect prenatally ascertained cases, were used to estimate the number of live births, stillbirths and fetal deaths affected by NTDs.

**Data Collection Summary:****Timing of Measurement**

- Two 24-month time periods
  - Pre-fortification period: 1995 to 1996
  - Post-fortification period: 1999 to 2000.

**Dependent Variables**

- Number of NTD-affected pregnancies and births determined as prevalence multiplied by the average total number of US births during pre-fortification and post-fortification years. Total US births derived from National Vital Statistics System.
- Fetal deaths and elective pregnancies: Difference between systems with and without prenatal ascertainment.

**Independent Variables**

- Time period: Pre- vs. post-fortification
- Systems with prenatal ascertainment: Estimated total number of pregnancies, including live births, stillbirths, prenatally diagnosed cases and elective terminations
- Systems without prenatal ascertainment: Estimated total number of live births, stillbirths and fetal deaths at 20 or more weeks.

**Control Variables**

None reported.

**Description of Actual Data Sample:**

- *Initial N*: Not reported
- *Attrition (final N)*: Not reported
- *Age*: Not reported
- *Ethnicity*: Not reported
- *Other relevant demographics*: Not reported
- *Anthropometrics*: Not reported
- *Location*: Not reported.

## Summary of Results:

- The estimated number of NTD-affected pregnancies in the United States declined from 4,000 in 1995 to 1996 to 3,000 in 1999 to 2000
- After fortification there was a 27% decline in NTD-affected pregnancies among systems with prenatal ascertainment and a 26% decline among systems without prenatal ascertainment.

### Estimated Average Annual Numbers\* of Spina Bifida and Anencephaly Cases Based on Prevalence\*\* from Surveillance Systems With and Without Prenatal Ascertainment; United States 1995-1996 and 1999-2000.

	Pre-fortification (1995-1996)			Post-fortification (1999-2000)		
Category	Spina Bifida [Prevalence (No.)]	Anencephaly [Prevalence (No.)]	Total	Spina Bifida [Prevalence (No.)]	Anencephaly [Prevalence (No.)]	Total
<b>Systems with prenatal ascertainment***</b>	6.4 (2,490)	4.2 (1,640)	4,130	4.1 (1,640)	2.5 (1,380)	3,020
<b>Systems without prenatal ascertainment***</b>	5.1 (1,980)	2.5 (970)	2,950	3.4 (1,340)	2.1 (840)	2,180
<b>Fetal deaths and elective terminations+</b>			1,180			840

\* Per 10,000 births

\*\*Number of neural tube defect-affected pregnancies and births determined as prevalence multiplied by the average total number of US births during pre-fortification and post-fortification years (1995-1996 and 1999-2000). Total US births derived from National Vital Statistics System

\*\*\*Estimated total number of pregnancies, including live births, stillbirths, prenatally diagnosed cases and elective terminations

\*\*\*\*Estimated total number of live births, stillbirths and fetal deaths at 20 or more weeks.

1,180 fetal deaths (occurring at less than 20 weeks) or elective terminations occurred before

fortification, compared with 840 after fortification.

### Author Conclusion:

"The decline in NTD-affected pregnancies highlights the partial success of the US folic acid fortification program as a public health strategy. To reduce further the number of NTD-affected pregnancies, all women capable of becoming pregnant should follow the USPHS recommendation and consume 400mcg of folic acid every day."

### Reviewer Comments:

*Statistics were not reported.*

### Research Design and Implementation Criteria Checklist: Primary Research

#### Relevance Questions

- |    |   |     |
|----|---|-----|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | N/A |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?   | Yes |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?  | Yes |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies)  | N/A |

#### Validity Questions

- |      |   |     |
|------|---|-----|
| 1.   | <b>Was the research question clearly stated?</b>  | Yes |
| 1.1. | Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?   | Yes |
| 1.2. | Was (were) the outcome(s) [dependent variable(s)] clearly indicated?  | Yes |
| 1.3. | Were the target population and setting specified?   | Yes |
| 2.   | <b>Was the selection of study subjects/patients free from bias?</b>   | Yes |
| 2.1. | Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study? | Yes |
| 2.2. | Were criteria applied equally to all study groups?  | N/A |

2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
<b>3.</b>	<b>Were study groups comparable?</b>	No
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	No
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
<b>4.</b>	<b>Was method of handling withdrawals described?</b>	???
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	???
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
<b>5.</b>	<b>Was blinding used to prevent introduction of bias?</b>	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	Yes
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes

5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
<b>6.</b>	<b>Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?</b>	N/A
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	???
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	No
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
<b>7.</b>	<b>Were outcomes clearly defined and the measurements valid and reliable?</b>	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	N/A
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	???
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	No
7.7.	Were the measurements conducted consistently across groups?	N/A
<b>8.</b>	<b>Was the statistical analysis appropriate for the study design and type of outcome indicators?</b>	???

8.1.	Were statistical analyses adequately described and the results reported appropriately?	???
8.2.	Were correct statistical tests used and assumptions of test not violated?	???
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	No
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	No
8.6.	Was clinical significance as well as statistical significance reported?	N/A
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
<b>9.</b>	<b>Are conclusions supported by results with biases and limitations taken into consideration?</b>	<b>Yes</b>
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
<b>10.</b>	<b>Is bias due to study's funding or sponsorship unlikely?</b>	<b>Yes</b>
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes